CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION

ORDER NO. R4-2011-XXXX

WASTE DISCHARGE REQUIREMENTS
FOR
CEMEX, INC.
ENHANCED IN-SITU BIOREMEDIATION OF VOLATILE ORGANIC COMPOUNDS (VOCS) IN GROUNDWATER IN THE RHO-CHEM FACILITY
(FILE NO. 11-065)

The California Regional Water Quality Control Board, Los Angeles Region, (hereafter Regional Board) herein finds that:

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1. CEMEX, Inc. (CEMEX; hereafter Discharger) has filed a Report of Waste Discharge and applied for Waste Discharge Requirements to use carbon substrates (sodium lactate and food grade emulsified soybean oil) and a non-pathogenic (naturally derived, not genetically engineered) chlorinated-ethene degrading microbial consortium containing *Dehalococcoides* ethenogenes culture, (SiREM's KB-1), to bioremediate chlorinated volatile organic compounds (VOCs) in shallow groundwater through reductive dechlorination to environmentally acceptable, non-toxic ethene in groundwater at the Rho-Chem facility (site). The Discharger will implement a Pilot Study and if effective and after approval by the Executive Officer may proceed to a full-scale project.

2. The Rho-Chem facility has been in operation since the early 1950s, with the initial owner identified as American Better Chemicals (American). In 1974 American merged with ABCO Industries and changed the facility name to Rho-Chem Corporation. The facility began recycling waste solvents in 1964. In 1989 Browning Ferris Industries, Inc. acquired the site, which was then later acquired in 1990 by Southdown, Inc. (Southdown) retaining the Rho-Chem name. The operations and the site were then purchased by Phillip Services Corporation (PSC) in 1995 and Southdown was acquired by CEMEX in 2000. Based on the most recent acquisitions, CEMEX and Rho-Chem, LLC (formerly known as Rho-Chem Corporation) remain involved with respect to the assessment and remediation work at the site as the Respondents under a Corrective Action Consent Agreement (Consent Agreement) executed by the DTSC in reference to the Rho-Chem facility. Although Rho-Chem LLC is the legal facility owner, operator, and land owner of record, CEMEX is implementing the proposed remediation project. Consequently, CEMEX is listed as the Discharger only with respect the implementation of the remediation project as described herein.

3. The site encompasses approximately 1.1 acres and is located at 425 Isis Avenue in Inglewood, California (Latitude 33° 57'28" North, Longitude 118° 22'32" West, see Figure 1). The site is located in a predominantly industrial and commercial area and is a Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility permitted to store, treat, transfer, and recycle hazardous wastes. Rho-Chem's current operations and services include liquid fuel blending, solvent recycling (fractionation column, batch distillation, and thin film development), and solvent distribution. The facility also provides hazardous waste transfer, storage, and consolidation services. In addition, the facility receives corrosives and waste water material for consolidation and off-site treatment. The pilot study area (subject treatment area) covers a small portion of the southwest corner of the site. Figure 2 shows the site boundary and location of the subject treatment area. The term "off-site" refers to off-site groundwater monitoring wells MW-7, MW-8, and MW-10. Figure 3 depicts the well network for the site.

4. In response to a request from this Regional Board, Rho-Chem, through its environmental contractor, J.H. Kleinfelder and Associates, conducted a site investigation in 1985 to undertake a

leak detection program for the underground storage tanks (USTs) at the site. This site investigation involved drilling soil borings and collecting soil samples.

5. In 1988, Rho-Chem, through its environmental contractor, Ecology and Environment, Inc., performed a United States Environmental Protection Agency (U.S. EPA)-mandated RCRA Facility Assessment (RFA). The RFA included a site inspection, interviews with facility personnel, and review of facility files.

6. From 1991 to 1994, Southdown, through its environmental contractor, Radian Corporation, conducted three phases of RFAs to characterize the presence of constituents of concern (COCs) in soil and groundwater at the site.

7. Since 2002, CEMEX, through its environmental contractor, AMEC Geomatrix, Inc. (AMEC; formerly known as Geomatrix Consultants, Inc.), conducted various phases of site characterization to further assess the distribution of COCs in soil and groundwater under the direction of the Department of Toxic Substances Control (DTSC).

8. In 2002, CEMEX and Rho-Chem, LLC (formerly known as Rho-Chem Corporation; collectively the Respondents) entered into a Consent Agreement executed by the DTSC in reference to the Rho-Chem facility addressing investigation and remediation of the facility. The Consent Agreement was drafted following the discovery of impacted soil and groundwater at the site.

9. The site-wide investigations show that the primary wastes detected in soil and groundwater are VOCs. Maximum historical VOC concentrations in groundwater samples collected from on-site groundwater monitoring wells include 76,300 micrograms per liter (µg/L) of tetrachlorothene (PCE), 118,000 µg/L of trichloroethene (TCE), 86,200 µg/L of 1,1,1-trichloroethane (1,1,1-TCA), 27,300 µg/L of 1,1-dichloroethene (1,1-DCE), 47,800 µg/L of cis-1,2-dichloroethene (c-1,2-DCE), 4,700 µg/L of carbon tetrachloride, 4,490 µg/L of 1,1-dichloroethane (1,1-DCA), 2,170 µg/L of 1,2-dichloroethane (1,2-DCA), 302,000 µg/L of methylene chloride, and 800 µg/L 1,4-dioxane.

10. Shallow groundwater beneath the site is first encountered at a depth of approximately 92 feet below ground surface. Shallow groundwater is unconfined and occurs within the semiperched aquifer. The semiperched aquifer yields very small quantities of water, suggesting low productivity for groundwater extraction. Underlying the semiperched aquifer is the Bellflower aquitard which limits the percolation of groundwater from the semiperched aquifer to the underlying aquifers. Underlying the Bellflower aquitard is the Gage aquifer which occurs at approximately 150 to 210 feet below ground surface.

11. There are no water supply wells located within an approximate two-mile radius of the site.

12. A soil vapor extraction system began operation in late July 2011 to remediate VOC impacted soil at the site.

13. Between April 2008 and March 2009, CEMEX, through AMEC, conducted a laboratory biodegradation bench-scale study using site groundwater and aquifer sediments. The bench-scale study demonstrated evidence of complete reductive dechlorination of the chlorinated VOCs present in site groundwater through the production of ethene.

14. A Pilot Study Work Plan presents the rationale and procedures for pilot-scale implementation of enhanced in-situ bioremediation at the subject treatment area to remediate VOCs in shallow groundwater (semiperched aquifer) using carbon substrate amendments and bioaugmentation with

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KB-1. Two kinds of carbon substrate amendments will be used during the pilot test (a Quick Release Carbon Substrate [QRCS] and a Slow Release Carbon Substrate [SRCS]). Wilclear Plus Sodium Lactate with Accelerite will be used as the QRCS, which contains 29 percent lactate, 11 percent other volatile fatty acids (propionate, acetate, butyrate), and 21 percent Accelerite (a blend of vitamins, growth factors, and nutrients), and other fermentables. The SRCS will contain an emulsified oil substrate (EOS) and a pH buffer (AquaBupH). EOS contains 60 percent food grade soybean oil, 4 percent fast release soluble substrate, 10 percent emulsifiers/food additives/preservatives, and 26 percent water. AquaBupH contains soybean oil with a suspension of a particulate alkaline pH buffering material. KB-1 is a naturally derived non-pathogenic chlorinated-ethene degrading microbial consortium. A conservative tracer, sodium bromide (NaBr), will also be injected to evaluate the fate and transport of the injection solution.

15. During the Pilot Study, both carbon substrate amendments and microbial consortium KB-1 will be injected through a temporary groundwater recirculation system to evaluate the effectiveness of delivery and biologic reduction of chlorinated VOCs.

16. A temporary groundwater recirculation system will be set up to facilitate and control the delivery of carbon substrates and KB-1. Groundwater will be extracted from a downgradient well GCW-2 (Figure 2), treated in an above-ground treatment system, amended with carbon substrates and/or KB-1, and reinjected into an upgradient well GCW-1.

17. A groundwater sampling and analysis program will be conducted prior to, during, and after the Pilot Study to closely monitor groundwater conditions. Groundwater monitoring will be conducted from five on-site wells. Analysis will include (1) field parameters (e.g., temperature, conductivity, pH, dissolved oxygen [DO], and oxidation-reduction potential [ORP]), (2) VOCs, (3) electron donor parameters (e.g., total organic carbon [TOC] and volatile fatty acids [VFAs]), (4) redox sensitive parameters (e.g., ferrous iron, sulfate, nitrate, nitrite, and methane), (5) bioactivity parameters (e.g., alkalinity, ammonium, total Kjeldahl nitrogen [TKN], and total phosphorous), (6) microbial parameters (e.g., Phospholipid Fatty Acids [PLFA], *Dehalococcoids* [DHC], and Compound Specific Isotope Analysis [CSIA]), and (7) dissolved metals (such as arsenic).

18. Progressive changes in local groundwater quality will occur over a relatively short period of time, leading to an overall groundwater quality improvement. The bacterial population added to promote complete reduction of PCE daughter products will only grow in the area where amendments (food source) are added. The spread of the bacterial population will be limited to anaerobic areas near and between groundwater recirculation points during and from a period of time after amendment addition, and will be controlled by areas where the groundwater system is aerobic.

19. Control measures will be implemented if carbon substrate solutions and DHC associated with the bioaugmentation culture are detected in monitoring points at the property boundary (Monitoring Well MW-3) during the groundwater monitoring events. These measures would involve stopping further addition of amendments to the groundwater. After this control measure has been implemented, it is expected that the remaining amendments in the groundwater will naturally break down, effectively removing food source and allowing the groundwater system to return to more aerobic conditions. The bioaugmentation culture (KB-1) requires an electron donor/carbon substrate amendment (food), VOCs, and anaerobic conditions to survive. Given these growth requirements, the bioaugmentation culture will not survive due to the loss of the food source and anaerobic conditions.

20. California Water Code section 13260 requires any person who discharges waste or proposes to discharge waste that could affect the quality of the waters of the state is required to submit a report

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of waste discharge. California Water Code section 13263 authorizes the Regional Board to issue waste discharge requirements that implement the water quality control plan (Basin Plan). The injection of the substrate solutions into groundwater is a discharge of waste as defined in section 13050 of the California Water Code and is subject to Water Code sections 13260 and 13263. In this case, the discharge of carbohydrate solution with chlorinated-ethene degrading consortium KB-1 is intended to improve water quality by providing a more effective remediation of chlorinated VOC-impacted groundwater and is expected to significantly reduce the anticipated groundwater cleanup time as compared to traditional pump-and-treat technology or enhanced in-situ bioremediation without addition of KB-1.

21. The application of carbon substrate amendments with the addition of KB-1 to groundwater may result in temporary adverse impacts to groundwater quality, but impacts that may result will be localized, of short-term duration, and will not impact any existing or prospective uses of groundwater. The addition of a carbohydrate solution with KB-1 will improve groundwater conditions by promoting complete degradation of VOCs.

22. On January 24, 2002, this Regional Board adopted General Waste Discharge Requirements for Groundwater Remediation at Petroleum Hydrocarbon Fuel and/or Volatile Organic Compound Impacted Sites (Order No. R4-2002-0030). This Order permits the injection of selected carbon substrate amendments (i.e. lactate, edible oils, ethanol, etc.) and conservative tracers (such as NaBr) proposed for use at this site. Subsequent to adoption of the initial General WDR, Order No. R4-2002-0030 has been revised six times to apply to the use of additional materials. The latest revision of the Order (Order No. R4-2007-0019) was adopted on March 1, 2007, and supersedes the previous version.

23. The General WDR does not cover the use of KB-1. Therefore, these site-specific waste discharge requirements have been developed for the addition of KB-1 at this site and will also apply to the injection of the carbohydrate solution. If the enhanced in-situ bioremediation Pilot Study at the selected treatment area proves successful, the application may be expanded to additional locations on-site as a full-scale remedy at which time, the Discharger shall submit a Work Plan Addendum for the use of enhanced in-situ bioremediation with KB-1 at any other areas within the site and the aerial extent of new treatment area. Once the Work Plan Addendum is authorized by the DTSC, the Regional Board Executive Officer may approve the expanded use of enhanced in-situ bioremediation with KB-1, including increased volume, areal extent, and length of time for the project. Prior to Executive Officer's approval for full-scale remediation, the Discharger shall demonstrate to Executive Officer's satisfaction that (1) the Pilot Study is effectively treating the waste, (2) that carbon substrate amendment and *Dehalococcoides* (DHC) associated with KB-1 are not observed to be detected at off-site observed monitoring wells MW-7 (east), MW-8 (southeast), and MW-10 (west), (3) that the Pilot Study has not resulted in groundwater containing concentrations of chemical substances or its by-products, including KB-1 in amounts that adversely affect any designated beneficial use as a result of the injection of solution.

24. The Regional Board adopted a revised Water Quality Control Plan for the Los Angeles Region (Basin Plan) on June 13, 1994. The Basin Plan designates beneficial uses for the West Coast Groundwater Basin, establishes water quality objectives to protect those uses, and contains implementation programs. The requirements contained in this Order, as they are met, will be in conformance with the Basin Plan.

25. The designated beneficial uses for the West Coast Groundwater Basin are municipal and domestic water supply (MUN), and industrial service (IND) and industrial process supply (PROC). The water

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quality objectives for the West Coast Groundwater Basin to protect these uses are 800 mg/L for total dissolves solids (TDS), 250 mg/L for sulfate, 250 mg/L for chloride, and 1.5 mg/L for boron.

26. State Water Resources Control Board (State Water Board) Resolution 68-16 ("Statement of Policy With Respect to Maintaining High Quality of Waters in California") requires the Regional Board in regulating discharges of waste to maintain high quality waters of the State until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and potential beneficial uses, and will not result in water quality less than that described in plans and policies (e.g., quality that exceeds water quality objectivess). The discharge of substrate solution may result in some localized temporary exceedances of background concentrations of TOC, iron, manganese, arsenic, TDS, and certain microorganisms. However, after the injection of amendments and selected bacteria culture, these parameters are not anticipated to exceed the water quality objectives beyond background water quality. The temporary degradation allowed by this Order is consistent with Resolution No. 68-16 since (1) the purpose is to accelerate and enhance remediation of groundwater pollution and such remediation will benefit the people of the State; (2) the degradation is limited in scope and duration; (3) best practicable treatment and control, including adequate monitoring and control to assure protection of water quality, are required; and (4) the discharge will not cause water quality objecitves to be exceeded beyond the treatment zone.

27. The Regional Board is the lead agency for this project under the California Environmental Quality Act (Public Resources Code section 21000 et seq.) and has conducted an Initial Study in accordance with section 15063 of the "State CEQA Guidelines" at California Code of Regulations, title 14, section 15000 et seq. Based upon the Initial Study, the Regional Board prepared a Mitigated Negative Declaration that the project will not have a significant adverse effect on the environment and in Resolution No. R4-2011-XXXX, the Regional Board adopted the Mitigated Declaration and approved the Initial Study. This Order includes a mitigation requirement in Provision C.12 to require removal of waste if the discharge causes pollution. This Order includes a monitoring and reporting program to assure protection of water quality.

28. In accordance with regulations adopted by the State Board in September 2004 regarding electronic submittal of information (ESI), the Discharger has been electronically submitting monitoring reports required under the WDRs to the State Board GeoTracker system in addition to submitting copies of the reports to the Regional Board. The requirements in this Order, as they are met, are in conformance with the ESI regulations.

29. The Regional Board has notified the Discharger and interested agencies and persons of its intent to prescribe Waste Discharge Requirements for this discharge and has provided them with an an opportunity to submit written comments and to present oral comments at a public hearing. The Regional Board has considered all comments pertaining to the discharge and to the tentative requirements.

IT IS HEREBY ORDERED that CEMEX, Inc., in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted here under, shall comply with the following:

A. Discharge Limits

1. The Discharger shall not cause off-site groundwater to exceed background concentration of TDS established prior to start of remediation.

2. The discharge of carbohydrate solution with chlorinated-ethene degrading consortium, referred to as KB-1, into the groundwater shall be only performed while this Order is in force.

3. During this Pilot Study, the injection volume of carbohydrate solution and KB-1 shall not exceed 30,000 gallons, unless an increased volume is approved by the Executive Officer based on a determination as set forth in Finding 23. If the enhanced in-situ bioremediation pilot study at the subject treatment area proves successful, the application may be expanded to additional locations on-site as an expansion of the pilot study or conversion to an on-site full-scale remedy upon approval of the Executive Officer based on a determination as set forth in Finding 23. If expansion is feasibly or conversion to full-scale is appropriate, the injection shall not exceed 435,000 gallons of carbohydrate solutions and 24 gallons of KB-1 and consistent with full-scale workplan approval by DTSC.

4. Discharge duration for the pilot study shall not exceed three years, unless approved by the Executive Officer. Discharge duration for the full-scale remedy shall not exceed six years. The actual discharge duration during the implementation of the full-scale system shall be adjusted based on the remedial progress and monitoring results and approved by the Executive Officer based on a determination as set forth in Finding 23.

B. Discharge Specifications

1. The Discharger shall stop further addition of amendments to the groundwater if carbon substrate amendment and *Dehalococcoides* (DHC) associated with KB-1 are observed to be detected at off-site observed monitoring wells MW-7 (east), MW-8 (southeast), and MW-10 (west). The off-site monitoring wells will be analyzed for DHC if; 1) there is a detection of DHC in MW-3, or 2) measurements of dissolved oxygen reach <1.0 milligrams per liter and the oxygen reduction potential reduces to a negative range.

2. The Discharger shall not cause KB-1, the amendment, and the by-products of the bioremediation process to migrate off-site during the pilot study.

3. The discharge of carbohydrate solution with KB-1 or any by-products into any surface water or surface water drainage course is prohibited.

4. The Discharger shall not cause groundwater to contain taste or odor producing substances in concentrations that cause nuisance.

5. The Discharger shall not cause groundwater to contain concentrations of chemical substances or its by-products, including KB-1 in amounts that adversely affect any designated beneficial use as a result of the injection of solution.

6. Prior to implementation of full-scale remediation, the Discharger shall demonstrate to Executive Officer's satisfaction and approval that (1) the Pilot Study is effectively treating the waste, (2) that carbon substrate amendment and *Dehalococcoides* (DHC) associated with KB-1 are not observed to be detected at off-site observed monitoring wells MW-7 (east), MW-8 (southeast), and MW-10 (west), (3) that the Pilot Study has not resulted in groundwater containing concentrations of chemical substances or its by-products, including KB-1 in amounts that adversely affect any designated beneficial use as a result of the injection of solution.

C. Provisions

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1. This Order includes the attached "Standard Provisions Applicable to Waste Discharge Requirements," which are incorporated herein by reference. If there is any conflict between provisions stated herein before and the attached "Standard Provisions," then the provisions stated herein shall prevail over the Standard Provisions.

2. Discharge of wastes to any point other than specifically described in this Order is prohibited.

3. In the event of any change in name, ownership, or control of the site, the Discharger shall notify this Regional Board in writing and shall notify any succeeding owner or operator of the existence of this Order by a letter, a copy of which shall be forwarded to this Regional Board.

4. A copy of this Order shall be maintained at an on-site office and be available at all times to operating personnel.

5. In accordance with section 13260 of the Water Code, the Discharger shall file a report of any material change or proposed change in the character, location or volume of discharge.

6. The Discharger shall notify the Regional Board immediately by telephone of any adverse condition resulting from this discharge or from operations producing this waste discharge, such notifications to be affirmed in writing within one week from the date of such occurrence.

7. This Regional Board considers the Discharger and Rho-Chem (Respondents under the Corrective Action Consent Agreement) to have continuing responsibility of correcting any problem that may arise in the future as a result of this discharge.

8. All work must be performed by or under the direction of a civil engineer, professional geologist, or certified engineering geologist. A statement is required in all technical reports that the qualified professional in direct responsible charge actually supervised or personally conducted all the work associated with the project.

9. The use of carbon substrate amendments with KB-1 shall not cause a condition of pollution as defined by California Water Code, Section 13050.

10. The Discharger shall comply with all conditions of this Order, including timely submittal of technical and monitoring reports as specified in the attached Monitoring and Reporting Program No. CI-XXXX. Violation of any conditions may result in enforcement action, including Regional Board or Court Order requiring corrective action or imposition of civil monetary liability, or revision, or rescission of the Order.

11. This Order does not exempt the Discharger from compliance with any other laws, regulations, or ordinances, which may be applicable. This Order does not legalize the waste treatment site, and leaves unaffected any further restraints on the site that may be contained in other statutes or required by other agencies.

12. The Discharger shall cleanup and abate the effects of injecting amendment solution as specified in this Order, including extraction of any by-products which adversely affect beneficial uses, and shall provide an alternate water supply source for municipal, domestic or other water use wells that become polluted in exceedance of water quality objectives as a result of this discharge.

13. In accordance with section 13263 of the California Water Code, this Order is subject to periodic review and revision by this Regional Board.

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14. After notice and opportunity for a hearing, this Order may be terminated or modified for cause including, but not limited to:

    a. Violation of any term or condition contained in this Order.
    b. Obtaining this Order by misrepresentation, or failure to disclose all relevant facts.
    c. A change in any condition that requires either a temporary or permanent reduction or elimination of authorized discharge.

15. The Regional Board, through its Executive Officer, will modify the Monitoring and Reporting Program, as necessary.

D. Waste Discharge Requirements Review Date

This Order will be reviewed by December 8, 2016.

The Discharger must file a Report of Waste Discharge in accordance with California Water Code, Section 13263(e), not later than 120 days in advance of December 8, 2016, as application for issuance of new waste discharge requirements.

I, Samuel Unger, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Los Angeles Region on December 8, 2011.

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Samuel Unger
Executive Officer

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